

# **REDEFINING INNOVATION IN THE GLOBAL SOUTH: CRITICAL IMPERATIVES**

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**PANEL: SCIENCE TECHNOLOGY AND INNOVATION (STI) IN  
MEETING THE SUSTAINABLE DEVELOPMENT GOALS (SDGs)**

**UNCTAD COMMISSION ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT**

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## INTRODUCTION

This paper sets out to outline a set of propositions and define a transformational agenda that are necessary if science, technology and innovation (STI) are to make an optimal contribution to achieving the sustainable development goals (SDGs). This position draws on the author's work over several decades both as a research scholar and global advocate in the technology and human development arena.

The claims here are bold and may therefore produce discomfort, as the position taken is one that suggests that in thinking about and doing science, technology and innovation, an important inflection point has been reached. Therefore, the author calls for the international community to seize the opportunity to disrupt the status quo in terms of thinking about and doing STI and to draw on the resources, creativity and insights of all groups, not only those occupying positions of privilege, to tackle global problems and deliver substantial benefits. In the writer's view, there are three key areas of intervention required: re-conceptualize innovation, science and technology; diversify and democratize sources of knowledge that inform STI doing and policy making; define and develop more effective tools, mechanisms and institutions, in order to better align STI with the important challenges of sustainable human development, including within the context of the Technology Mechanism for Sustainable Development Goals.

This short paper is a summary and draws extensively from ongoing academic work, including primarily a very recent chapter to be published in a handbook on innovation policy in developing countries<sup>i</sup>, past work by the author as a policy advisor in South Africa and other developing countries, including for the CARICOM Secretariat and as a financial analyst, working with large investment banks to allocate financial capital for the development and deployment of technology-intensive systems. In my current role, leading an innovation intermediary in a small Caribbean island-nation, I have a front-row seat in understanding and trying to shape the decision making processes that underpin technology generation, development and deployment. My affiliation with a research center and teaching program at the Massachusetts Institute of Technology has also confirmed that technological and financial resources do not militate the

need to adapt our efforts to context and intentionality around serving human development is paramount. The next section presents the rationale for redefining STI from the global South, the penultimate section discusses the implications for policy making and the paper concludes with observations and recommendations for a variety of stakeholders including the UN system and other actors operating at the at global level.

## SCIENCE, TECHNOLOGY & INNOVATION: FROM THE GLOBAL SOUTH

This paper argues that a critical examination and reinterpretation of STI is necessary, taking into account how science, technology and innovation exist, are performed and create meanings in the global South, if the international community is to ensure that STI makes an effective contribution to achieving the SDGs. Particularly in the context of this meeting, it may seem odd to move away from regarding science, technology and innovation as anything but settled categories, particularly in the international development policy context, where STI scholars mainly serve to remind and even harangue about the importance of STI for development. But, this is exactly what I am setting out to do, and am joined in this work by a loose collection of scholars, organized as a community of practice.

Our aim is to offer a set of alternative definitions and framings of science, technology and innovation that challenge the status quo and to undertake research, policy advice and other forms of advocacy to support our claim that the alternatives presented provide a more valuable starting point in the global South.

In carrying out this project, Marcelle (2016a) offers a definition of innovation as follows:

*Innovation is an intentional process of generating, acquiring and applying knowledge aimed at producing economic and/or social value. In developing countries, this process typically takes place through the unfolding over time of a wide variety of learning and capability-building processes, rather than through the mastery of science and technological knowledge. Innovation is an investment effort in which knowledge, financial capital and other resources including cultural and social capital are deployed over time to create value. Deftly undertaken innovation can lead to the transformation of systems, values and culture as well as the production of new and/or improved products or processes.*

First, this definition of innovation tackles head-on some of the most pervasive biases in STI theorizing and policy making. This approach eschews the **novelty bias** that is pervasive in the mainstream treatments of innovation both in policy and management circles and suggests that use-value is perhaps an even more important motivation and organizing principle for innovation in the global South. The importance of this distinction is quite dramatic, given the effort that is currently underway in developing countries to measure, monitor and worry about the extent to which their private sector firms and public sector organizations are able to produce goods and services that are either new to the world (radical innovation) or new to their environments (incremental innovation). In public policy and scholarly circles, there are well-established systems (with the related intellectual apparatus) to establish novelty and degrees of radicalness or closeness to fundamental scientific breakthroughs as the holy grail of innovation pursuit. This even despite the fact that in the global North, the largest majority of wealth is generated through incremental innovation and smart-follower strategies, including by companies associated with innovation success such as Apple. This framework positions **economic and social value as being equally important** motivations for triggering the innovation impulse and for securing its effectiveness over time.

One of the aims of the SDGs is to link economic growth with sustainable human development objectives, including reduction in inequality and environmental stewardship. An innovation framework and mindset that privileges novelty over other attributes and values, in my opinion, is out of step with the philosophy behind the SDGs and supports the claim that we need to develop and excavate other alternatives.

Secondly, this treatment places considerable emphasis in framing innovation as a multifaceted process of generating and transforming knowledge derived from a **plurality of sources**. In so doing it explicitly challenges the notion that *modern* science and technology, as performed in formal institutional settings, is the dominant and most important progenitor of innovation outcomes. By understanding how

innovation processes actually play out at the coalface in the global South, especially since in much of this context, science systems are not well developed and are under-resourced, the framework produces an understanding of and places value on non-scientific and technological sources of innovation, rather than ignoring them. This approach admits many of the interesting insights derived from science and technology studies that have shown convincingly that science and technology are not stable, universal, categories across disciplines, time and cultural contexts and uses this to question why in STI policy and programming for the developing very little of this nuance is taken into account. In tackling the SDGs it is the difficult and context-specific insights regarding how STI contribute to development that are likely to yield most value, rather than the undistinguished stylized facts. Allowing for plurality and even going further to democratization of the STI project poses a huge challenge because it requires actors from across many different settings to be admitted to the table of designing and bringing about change on the basis of mutual respect. Elite science and big government having established their legitimacy will not easily give up positions of power and dominance.

This may be a challenging notion to my colleagues in this room, who have had to fight to establish specialized Ministries of Science, Technology and Innovation; we will return to the implications of the call to admit plurality of sources of knowledge rather than privileging modern Western science and technology and innovation role models.

This definition is also a critique of conceptualizations of innovation that are **research and development (R&D) centric** (see Stokes, 1997 for a good treatment of how the R&D-centric bias arises). In this regard, it builds on and extends other work for example, Ernst and Kim (2002), Mytelka and Smith (2001) and Lundvall et al. (2009) that has suggested that non-conflation of innovation with R&D and science outputs is important.

Thirdly, by focusing more on the **actual processes of innovation and variation in effectiveness**, this definition and the framework from which it is derived allows for a closer examination

of initial conditions, dynamics, micro-level factors that support improved effectiveness, motivations and blockages. The framework suggests that innovation performers engage in bidirectional knowledge flows that involve linkages and interactions, its effectiveness being influenced by the extent to which knowledge circulates freely. When innovation is framed as a knowledge circulation process, it can be shown that it becomes most effective in producing societal value when all actors have shared meanings, common understandings and mutually reinforcing objectives. This aspect of the definition and framework draws on strategic management literature including a very useful paper by on motivations, processes and outcomes of innovation (Crossan and Apaydin, 2009) as well as empirical studies guided or undertaken by the author (Marcelle, Nkhumise and Vawda 2016b, Marcelle 2004). The framework envisaged by this definition is an open one, in which performers of innovation are linked to other actors outside enterprise and national boundaries. There is importantly, no trade-off between openness to knowledge sourced outside borders and the strengthening of domestic technological capabilities (Marcelle, 2004; Bell, 2009). The definition builds on this author's work on processes for acquiring technology components and building technological capability using extra boundary resources over which an enterprise has only partial control.

Finally, by framing innovation in this way, and taking a critical view, the approach allows for focus on the **blockages to innovation** which take place in realms that have received insufficient attention, including the psychological, cognitive and cultural environments that encourage and support risk-taking, creativity and entrepreneurship.

Using this approach as a starting point, the author suggests that important interventions are required to transform STI policymaking so that policymakers draw more from their lived reality and ask deeper questions rather than accepting the status quo. An agenda for STI policy making that pays attention to enterprise-level perspectives on and dynamics of innovation as well as adopting a grounded and context based stance to policy making is recommended. In capturing the richness of innovation experimentation that is underway in the global South, the literature emerging in strategic management

termed frugal innovation, reverse innovation and constraint-based innovation offers valuable insights, although to date, this material is heavily concentrated in the Indian experience, but that is beginning to change. Marcelle (2016a) cautions that it is absolutely necessary to draw from intellectual sources other than those that adopt the dominant design of national innovation systems if STI is to yield an optimal contribution to shared goals. This is taken up in the next section.

## IMPLICATIONS FOR PUBLIC POLICY

The main point here is that there is a dominant design in the world of STI policymaking, which has crowded out alternative voices and approaches such as the one being suggested here, through a process of intellectual lock-in, with the result that STI policy is underperforming, and science, technology and innovation as it occurs in the global South is not well understood. The starting point for thinking about and assessing STI success starts off with a national innovation systems approach and proceeds from there to experiment with efforts to improve the scale, scope and functioning of the system. There is also considerable inertia and very little analytical and policymaking capacity in most of the global South in the field of STI policy. The consequence of all of this combines to create conditions under which very little outside formal systems (which are often also reduced only to the publicly controlled parts of the system) are considered. Motivations, blockages, sources of knowledge, values, attributes and many other important dimensions that have been shown to influence innovation outcomes and performance do not show up at the national level of aggregation. This paper urges that we move well beyond this blunt treatment to provide contextually specific, industry and even technology specific policy recommendations so that STI can make a more valuable contribution to the SDGs.

In order to do this, STI research, data gathering policy making, even at the stage of vision setting, should look to a richer set of sources of intellectual material including of strategic management, new business models of innovation, the learning school, scarcity-induced framework of innovation, and the innovation for social purposes literature.

There should also be a conscious effort to include and understand how actors other than universities, public research organizations and large firms undertake innovation. We should avoid narrowing the curriculum within innovation studies and STI policy as well as other strategies of gate keeping and exclusion. In innovation studies there is a growing conservatism, which is showing up as a dominance of economistic and quantitative explanations as opposed to historical analysis and appreciative theorizing (Jalonon, 2012). We need to (re)claim the heterodox and radical roots of innovation studies and strengthen these aspects rather than retreating to economistic explanations.

The innovation studies field is not however completely static; within the very recent past, it was acknowledged that there has been a relative neglect of the social dimension of innovation and that scholarship in the area often still remains technologically determinist. These weaknesses will have to be addressed if STI is to deliver maximum value to the SDG agenda.

Some good practice comes from challenges to the dominant paradigm in the global North where now prominent scholars have outlined their approaches to establish opposing explanations. These cases of establishing legitimacy confirm that new approaches encounter resistance that is both explicit and implicit and the journey can take many years to overcome (Baldwin and von Hippel 2010). What is noteworthy is that scholars who associate themselves with the *user-centred* alternative to producer-centred innovation have deployed quite a comprehensive set of tools including conferences, journals, taught postgraduate programmes and policy advocacy to garner support for competing explanations of innovation. The efforts in establishing this new paradigm or counter explanation has now extended to including questions in the national and European Commission innovation surveys, in order to obtain cross-country empirical data on the phenomena, over time. The scholars putting forward these alternatives organized themselves and in some instances take on the form of a movement. In this writer's observations, there is neither the willingness nor the organizational strategies in place to critique the status quo when it comes to advocating alternative treatments of innovation in the global South (see



Marcelle, 2012, for a discussion of an advocacy and research agenda in this direction), despite compelling evidence that the dominant tradition requires some fundamental adaptation.

There is in my view, variation across regions of the developing world, with Latin American scholars and those that are concerned about social equity appear to be leading the way in questioning the prevailing assumptions of the dominant tradition (Cassiolato et al. 2003, Melo, 2001). Elsewhere the status quo is more intact, and intellectual and policy efforts are focused on building and creating national innovation systems and addressing systemic failures, rather than critiquing, extending and expanding the framework or offering new conceptual frameworks that better explain how innovation performs in those contexts. The absence of critique, in the view of this author, is most entrenched in Africa, where presumably out of the concern of being 'left behind' and unable to catch up there is considerable effort to put in systems to measure innovation according to conventional definitions and to design institutional, often state-led apparatuses to supposedly carry out the functions of the components of national systems of innovation. In Africa's largest and most sophisticated economy, South Africa, this trend is most prominent. There is a large well-developed primarily state-funded set of institutions that purport to be the national innovation system, but the framework conditions for effective innovation performance, including a high-quality basic and advanced education system and the more specialist functions of an innovation system do not receive adequate attention. Successful projects such as the rollout of independent power producers to deploy renewable energy and reduce reliance on coal has not been conceived as an STI project, but was led elsewhere in the governmental system.

Bold departures from the status quo are required most in the least developed countries where local innovation systems are often weak and underdeveloped and therefore are not substitutes for the knowledge and technological inputs that can be acquired from global markets and other non-market sources. As we have suggested in the framework proposed here, it is important to consider innovation as a process in which enterprises of great variety undertake engagement with the global innovation system. In some instances it is this exposure that can become a trigger for strengthening domestic capabilities

and a source of learning (Marcelle, 2004; Bell 2009). The central message here is that although it may seem counter intuitive, unless there is a simultaneous effort to strengthen both public and private sector actors, where the need is greatest, the ability to tackle major problems is unlikely to succeed.

Efforts to find the appropriate balance between market forces or state intervention to influence the outcomes of innovation processes has been on the agenda for more than thirty years (Mowery and Rosenberg, 1979) and is still proving to be intractable. This paper suggests that the SDGs provide a moment to move away from narrow considerations of the architectural aspects of STI to aspects that are more fundamental to development objectives.

## CONCLUDING REMARKS

Recent research carried out by the author in South Africa suggests that there is much work to be done to engage the private sector, to include non-formal actors, as well as to include sources of knowledge outside of Western science and technology. This failure to engage innovation performers has resulted in innovation policies that are suboptimal; South Africa uses, both at national and regional levels, blunt instruments which do not acknowledge or respond to variation in innovation positions, paths and processes of the performers. These undifferentiated policies have resulted in a persistent challenge of funding innovation, even in areas that are earmarked for a strategic focus, such as the biotechnology industry. What makes this situation even more pernicious is that on the face of it and by the standards of the mainstream status quo, South Africa's STI policy is a success. Africa's most sophisticated economy, large in size and complex in structure has played by the rules – its national innovation system involves a number of public sector agencies and mechanisms and its R&D expenditure as a proportion of GDP has, except for very recent years, been increasing. Yet, South Africa's intractable human development problems such as poverty, unemployment, growing inequality, environmental degradation are not seen as being the main focus of STI effort and the enterprise remains state dominated (Marcelle, 2011a, b,c,d).

The international community and the mechanism to integrate STI into the SDGs can tackle this lacunae in developing countries around the world by tackling the prevalence of mistrust and sometimes outright hostility between the state, private sector actors and not for profits. An approach that explicitly assumes that there are plural and diverse sources of knowledge from which innovation proceeds can minimize this friction. However, we need also to do more and to develop working methods that can bring multiple stakeholders to the agenda. Despite the existence of evidence that successful innovation performance takes place often in spite of the role of government, there is a much more influential view that there is a need for government intervention in order to respond to market failure. There is very little traction or acceptance of the view that public bodies should exist to facilitate and work in active partnership with the private sector.

The emergence of new business models and strategies of innovation from enterprises operating in the global South provide an exciting point of departure. These treatments are optimistic and should be highly motivating. They provide accounts of Southern actors surpassing innovation performance of established firms and providing the inspiration for change. The source of success has been shown to include the ability to respond effectively to local environment and to master the competing demands of affordability, scale and quality. These are models that have rich insights for the SDG agenda.

A thorough program of policy reform is required that would include redefining the purpose of innovation and expanding its definition, reducing technological determinism, placing a focus on societal dimensions and paying greater attention to the nature of the process of innovation, including supporting learning and capability building and bidirectional knowledge flows among actors in the innovation ecosystem. There are a number of process recommendations, such as the call to increase levels of engagement with actors outside academia and change the methods used in research and policymaking, for example, by introducing ethnographic studies and other qualitative methods as complements to the quantitative and statistical research. All these efforts will require intellectual leadership from Southern

scholars and will also require our Northern partners to work together in a genuine quest for plurality and knowledge generation. UNCTAD has an outstanding reputation as far as recognizing the importance of this diversity and therefore, it is important that this is established as a principle for the technology mechanism for the SDGs and other related efforts.

In conclusion, this paper sets out a bold agenda of change, beginning at the conceptual point of departure and extending to work programs that constitute STI policy. innovation policy. Making these reorientations will not only foster improved partnerships between the market and the state but will contribute to the political problem of demonstrating the relevance of STI spending. As it stands, private sector firms underinvest in R&D in important areas, and universities and other public research bodies give them insufficient priority. This author believes that innovation including its science and technology components, where these are relevant, ought to be directed at developmental challenges. The perspective suggested here places STI at the center of human development, renders non-technological-based innovation more visible and explicitly includes the notion of applying innovation to social purposes. All of these interventions and transformations are needed to improve the performance of STI policy in the global South.

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<sup>i</sup> The references presented here draw from Marcelle (2016)

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# STI: Redefined and reframed

- STI can deliver more value, be more effective and thrive if we move beyond common biases and adopt new mindsets, concepts and frameworks.
- Innovation is a bidirectional knowledge circulation process that requires investment of financial, cultural, and human capital
- Key issues:
  - Novelty is not all that matters
  - Usefulness is as important as profitability
  - Integrate various types of knowledge from multiple sources
  - Innovation is not equal to R&D
  - Go beyond the comfort zone of formal sector and modern science; excavate and value traditional ways of knowing
  - Focus on understanding the process of innovation ( motivations, inputs, barriers, linkages, temporal dynamics and interactions ) rather than classifying outputs of the process or the degree of novelty

# The periphery strikes back....

- Wicked problems facing the global community require out of the box thinking in order to develop conceptually relevant, grounded, politically feasible solutions....the humanness of the challenge is what makes it messy, specific and complicated.....
- Settings where uncertainty, resource constraints and scarcity abound have lessons for the rest of the world. Societies and civilizations that have operated beyond duality and aligned natural, manmade and spiritual dimensions of life offer wisdom....
- Users, firms, farms and producers matter, sometimes even more than governments
- There is a non trivial problem to incorporate these approaches into solutions and to bring their proponents and leaders to the table.
- Jugaad innovation, reverse innovation, frugal innovation provide considerable optimism

# Transform STI theory, policy and programming

- Walk the talk of openness and diversity, particularly at a global level
- Excavate the lessons from development programming failures and successes, particularly those that focused on power dynamics
- Consider science as a dynamic category not one that is static
- Incorporate good social science critique of STI: avoid traps of technological determinism, assumptions of passivity and stereotypes
- Utilize all resources and interest groups ( governments, private sector, hybrid organizations, partnerships, organized civil society, individual citizens) and understand their roles, functions, motivations, interests and limitations

# Elements of an agenda for change

- Generate ideas, concepts that are informed by investigation and curiosity and based on ethics and principles
- Recognize structural and institutional shaping factors that support change or constitute barriers
- Articulate a bold, visionary agenda inspired by the ambition of the SDGs
- Devise strategies that include outliers, question biases and go beyond the status quo then... execute
- Continuously analyze, refine and recalibrate
- Keep changing, reflecting and striving for greater impact